

Application of the high-resolution APHRODITE precipitation product to rainfall-triggered fatal landslide occurrence in Nepal

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Rainfall triggers landslides worldwide, and understanding the relationship between local precipitation and slope failure is important in mitigating against disaster. The southern slopes of the Himalayas experience tremendous numbers of fatal landslides due to steep mountain slopes and heavy precipitation in summer monsoon season.

This study uses the fatal landslides database over Nepal assembled using systematic metadata online search tools identifying the location of a landslide between 2004 and 2015. A daily rain-gauge based grid precipitation (APHRODITE, 0.05 degree) data is used for the same period. We concentrate on the summer monsoon season (June-September), and rainfall-driven landslides with fatalities. Two clear west-east oriented rain-bands are observed from the west to the east of Nepal. These heavy precipitation zones correspond to the mountain slopes of Great Himalaya (north band) and Mahabharat (south band). Many fatal landslides occur along the north band, but that is few along the south band. The most number of fatal slides occurred in July, but the largest number of fatalities occurred in August. As a result, in some areas the probability of landslide occurrence increased as the amount of daily precipitation increased. We classified pentad precipitation pattern over Nepal and found a linkage between weak monsoon indices and heavy precipitation in the central and the western part of Nepal. Especially, in July, when global monsoon signal is strong, moisture converges in India and Nepal has less precipitation. On the contrary, when the monsoon trough is weak, moisture tends to converge in Nepal. Namely, the Indian-monsoon break phase causes heavy precipitation in either western and the central Nepal. The areas 1) Farwest Hill, 2) Mid-west Hill, 3) West Hill and 4) Central Hill have strong negative correlation between monsoon index and local precipitation, where percentage of fatal landslide occurrence is very high. Landslide risks exceeds 50% if they have more than 100 mm rainfall in two days in those areas.

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